UNSCEAR 2020/2021 Report (1/8): Purpose of the Report

Purpose

- Summarize all of the information available and assess its implications for the findings and conclusions presented in the UNSCEAR 2013 Report.
- Validate and, where necessary, revise estimates of doses to the public, based on more detailed analyses of the available information, and update the commentary on the health implications.
- Set out an improved appraisal of the uncertainties and variabilities in the estimates of doses to the public.
- Where possible, better address issues and objectives not fully addressed in the UNSCEAR 2013 Report.

Assessments by International Organizations

UNSCEAR 2020/2021 Report (2/8): Outline of Assessment of Public Exposure Doses

- For ease of comparison with the UNSCEAR 2013 Report, dose estimates have been made for the same age groups (20-year-old adult, 10-year-old child and 1-year-old infant) and the same dosimetric endpoints (the absorbed dose to selected organs – the thyroid, red bone marrow, colon and female breast – and the effective dose).
- Estimates have also been made of doses in the first year after the accident, over the first 10 years and until an attained age of 80 years for exposed individuals.
- In addition, estimates have been made of the average absorbed doses to the fetal thyroid over the 30-week development period of the fetus and of the average absorbed dose in utero to the red bone marrow over the 40-week term of pregnancy.

Exposure pathways

(a) External exposure to radionuclides in the air
(b) External exposure to radionuclides deposited onto the ground surface from the air by either wet or dry deposition
(c) Internal exposure from inhalation of radionuclides in the air
(d) Internal exposure from ingestion of radionuclides in food and drinking water

UNSCEAR 2020/2021 Report (3/8): Update from the UNSCEAR 2013 Report upon Assessing Public Exposure Doses

Points updated from the UNSCEAR 2013 Report

- Measurement data on people (in particular, those using personal dosimeters and whole-body counters (WBCs) and thyroid measurements)
- New measurements of concentrations of radionuclides in the air
- New information on radionuclides in foodstuff as consumed
- New information on occupancy factors
- New information on dose reduction factors (location factors)
- Information on protective measures

Assessments by International Organizations

UNSCEAR 2020/2021 Report(4/8): Estimation of Public Exposure Doses for Each of the Four Groups

Area classification for dose assessment

Group	Geographical area	Spatial resolution
1	Locations where people were evacuated in the days to months after the accident	Representative areas used for each location identified in 40 evacuation scenarios
2	Municipalities and parts of municipalities of Fukushima Prefecture not evacuated	Municipality level for external and inhalation pathways, based on the estimates for each of the 1-km grid points, averaged over the municipality Prefecture level for ingestion pathway
3	Selected prefectures (Miyagi, Tochigi, Ibaraki and Yamagata) in eastern Japan that are neighboring to Fukushima Prefecture	Municipality level for external and inhalation pathways, based on the estimates for each of the 1-km grid points, averaged over the municipality Average for the four prefectures (Miyagi, Tochigi, Ibaraki and Yamagata) for ingestion pathway
4	All remaining prefectures of Japan	Prefecture level for external and inhalation pathways Average of the rest of Japan (i.e., the 42 prefectures, excluding Fukushima, Miyagi, Tochigi, Ibaraki and Yamagata) for ingestion pathway

Assessments by International Organizations

UNSCEAR 2020/2021 Report(5/8): Results of the Assessment of Public Exposure Doses

Table 1. Average effective doses by area for the first one year and for the first ten years following the accident (mSv)*1

Group		For the first one year following the accident		For the first ten years following the accident	
		20 years old (adults) *2	1 year old (infants)	20 years old (adults) *2	1 year old (infants)
1[a]	Fukushima Prefecture (evacuated municipalities)	0.046-5.5	0.15-7.8		
2	Fukushima Prefecture (other than evacuated municipalities)	0.079-3.8	0.12-5.3	0.16-11	0.22-14
3	Prefectures neighboring Fukushima Prefecture [b]	0.10-0.92	0.15-1.3	0.25-2.5	0.34-3.4
4	The rest of Japan	0.004-0.36	0.005-0.51	0.009-1.0	0.007-1.3

Table 2. Estimated absorbed doses to the thyroid for the first one year following the accident (mGy)*1

Group		For the first one year following the accident	
		20 years old (adults)*2	1 year old (infants)
1[a]	Fukushima Prefecture (evacuated municipalities)	0.79-15	2.2-30
2	Fukushima Prefecture (other than evacuated municipalities)	0.48-11	1.2-21
3	Prefectures neighboring Fukushima Prefecture [b]	0.31-3.3	0.62-6.3
4	The rest of Japan	0.034-0.48	0.087-0.74

mSv: millisievert
mGy: milligray

a. Estimate evacuees' doses using 40 evacuation scenarios
b. Miyagi, Yamagata, Ibaraki, and Tochigi Prefectures

*1: Ranges of the average values by evacuation scenario for Group 1, by municipality for Groups 2 and 3, and by prefecture for Group 4
*2: Estimated doses for 10-year-old children are omitted here.

Assessments by International Organizations

UNSCEAR 2020/2021 Report (6/8): Comparison with Direct Measurements

1. When comparing the UNSCEAR's estimate of municipality-average absorbed doses to the thyroid from internal exposure and the corresponding values derived from direct monitoring of the same targeted groups, the ratio varies from about 0.4 to 1.3. Thus, the comparison shows very good agreement between the two sets of data.

Table. Comparison between estimated absorbed doses to the thyroid (median values) and measured doses (mGy)

Area	20 years old (adults) *1		1 year old (infants)	
	Estimated doses	Measured doses	Estimated doses	Measured doses
Iwaki City	1.2		2.6	4.6(55) *2
Kawamata Town	0.95		2.1	4.5(286) *2
Iitate Village	1.4		2.8	7.1(79) *2
Namie Town[a]	22	21(6) *2	41	
Minamisoma City[a]	5.8	6.5(15) *2	12	10(1) *2
Tamura City	0.50	1.2(1) *2	1.2	

a: Excluding evacuees immediately after the accident
*1: Estimated doses for 10-year-old children are omitted here.
*2: Figures in the parentheses are the numbers of the subjects for the measurements.

2. The sums of the doses from inhalation and ingestion intakes of Cs-134 and Cs-137 estimated by the UNSCEAR are broadly in agreement with the committed effective doses obtained through the WBC measurements targeting residents in Fukushima Prefecture.

Assessments by International Organizations

UNSCEAR 2020/2021 Report (7/8): Assessment of Health Effects on the General Public

- In the years since the publication of the UNSCEAR 2013 Report, no adverse health effects among Fukushima Prefecture residents have been documented that are directly attributable to radiation exposure from the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS.
- No acute health effects that could have been attributed to radiation exposure had been reported.
- Currently available methods would most likely not be able to demonstrate an increased incidence in the future disease statistics due to irradiation.
- The UNSCEAR's updated statistical power analyses suggest that excess thyroid cancer risk that could be inferred from radiation exposure was most likely not discernible in any of the age groups considered.
- These observations suggest that the increased incidence rates may be due to over-diagnosis (i.e., detection of thyroid cancer that would not have been detected without the screening and would not have caused symptoms or death during a person’s lifespan).

Assessments by International Organizations

UNSCEAR 2020/2021 Report (8/8): Comparison between Various Attributes and Consequences of the Accidents at Chornobyl and Fukushima Daiichi NPSs

	Chornobyl NPS Accident	Fukushima Daiichi NPS Accident
Thyroid doses of evacuees for the first one year following the accident	Around 500 mSv	Around 0.8 – 15 mSv (adults)
Effective doses of evacuees for the first one year following the accident	Around 50 mSv	Around 0.05-6 mSv (adults)
Thyroid cancers	Substantial fraction of the 19,000 thyroid cancers observed (up to 2016) among people who were children or adolescents at the time of the accident is attributable to radiation exposure.	• Greater incidence of thyroid cancer and abnormalities was observed in those screened than were expected based on national statistics. • It is most likely the result of using high resolution ultrasound in the screening. • There is an increasing body of evidence that the observed thyroid cancers are not attributable to radiation exposure.
Other effects (e.g., other cancers, birth defects, fetal deaths, non-cancer diseases, etc.)	There is no persuasive evidence of any other health effect attributable to radiation exposure at Chornobyl NPS or Fukushima Daiichi NPS.	